

Transducer 24 VAC/DC, with intrinsically safe circuits for passive sensors in hazardous locations Zones 0, 1, 2, 20, 21, 22; with display

Serie EX-LINE

Type EXL-IMU-1

APPLICATION

The transducer is an associated intrinsically safe device for transmitting signals of passive sensors in hazardous areas into safe areas like Pt100, Ni1000, resistor sensors The sensor signals are transformed in signals (0...10 V- and 0...20 mA). The programming and adjustments of sensors are carried out on the device. Different sensor characteristics are integrated (see table 1).

Each module has a back light LCD display, which is used for programming, to indicate alarm signals and during operation. The display shows the actual value. A potential free contact is integrated for error recognition.

The measurement ranges of sensors and the output signals can be adjusted to any requirements of the system. For programming no tools are necessary. The menu prompt is indicated over the display.

TECHNICAL DATAS

Supply/Frequency	24 VAC/DC +/- 20 %, 50...60 Hz
Nominal current, Power consumption	100 mA, ca. 3,6 W, internal fuse without socket
Sensor input	Intrinsically safe circuit for passive sensors
Suitable sensors	see table 1
Sensor selection	accomplished by the customer, with menu prompt
Programming	direct on device, without additional tools
Sensor connection	2-3-4 wire on light blue terminals
Wire compensation	2-wire push button, 3- and 4 -wire automatically
Acceptable wire resistor	< 100 Ohm
Stability	stability < 0,2 % / year, temperature influence < 0,02 %/K, supply voltage influence < 0,01 %, setting time 0,5 sec.
Accuracy	< 0,3 % end value
Galvanic isolation	between out-, input and supply voltage
A/D-converter	measure range 16 Bit, outputs 12 Bit
Outputs	Voltage U and current I parallel available with tie point (GND) against short circuit and separate source voltage < 30 V
Outputs are protected	0...10 V- adjustable, burden < 500 Ω, influence < 0,05%
Voltage output U	0...20 mA adjustable, burden < 750 Ω, influence < 0,1%
Current output I	open circuit voltage < 26 V
Signals in alarm mode	increase or decrease selectable, 0 V-/0 mA or 10 V-/20 mA
Display	4 1/2 digits LCD-Display + special signs, back light status indication and actual value display (blank)
Buttons	Push button for configuration/active mode, 5 buttons for setup, setup, menu prompt and parameter per display
Failure / alarm indication	over 1 potential free contact + output + display
Detection	faulty sensor connected, short circuit, wire break
Alarm indication 1 and 2	over contact and analogue output U/I, programmable
Failure- / alarm contact	Break contact, 24 V max. 1 A
work-/storage temperature	-10...+ 50 °C / -40 ...+ 80 °C
Electrically connection	Terminal, IP 20, max. 4 mm ²
Housing	Plastic, IP 40, for Din Rail mounting acc. to EN 50022
Dimensions and weight	w x h x l 45 x 75 x 110 mm, ca. 190 g
Type of protection	II(1)GD [EEx ia] IIC, acc. to EN 50014/ EN 50020 associated intrinsically safe device
Protection class	PTB 03 ATEX 2092, for sensors in Zone 0, 1, 2, 20, 21, 22
CE 0158	94/9/EG (ATEX), 89/336/EG (EMC)
Included in price	EXL-IMU-1 EEx-i Module with actual value display
Installation area	Module in safe area, sensors in hazardous locations

**II(1)GD [EEx ia] IIC
Zone 0, 1, 2, 20, 21, 22
PTB-approved acc. to
ATEX**



CONNECTABLE SENSORS - TABLE 1

Sensor table	Range	Characteristics	unit
Pt 100 DIN	-200..+850°C	temp.-linear	°C
Pt 500/1000 DIN	-200..+850°C	temp.-linear	°C
Ni100/200/500/1000 DIN	-60..+180°C	temp.-linear	°C
LS-Ni 1000 (Siemens)	-30..+130°C	temp.-linear	°C
KP 250 (Kieback&Peter)	-50..+150°C	temp.-linear	°C
LF 20 (Honeywell Special 1)	-20..+100°C	temp.-linear	°C
Resistor without slider	0... 1 kΩ	resistor-linear	variable
in display figure 2	0... 10 kΩ		
Resistor with slider	0... 10 kΩ	resistor-linear	variable
in display figure 3	0... 1 kΩ		
DFK-.. (Special 2)	x...y Pa	angle linear	Pa
VFK-.. für VAV (Special 3)	x...y m/s	angle SQRT	m/s

EEx-i circuits - TABLE 2

Nominal value	Maximal value on the terminal	
	II(1)GD [EEx ia] IIC	II(1)GD [EEx ia] IIB
Terminals	22-23-24-25	22-23-24-25
Voltage U ₀	7,5 V	7,5 V
Current I ₀	5 mA	5 mA
Power P ₀	10 mW	10 mW
Capacity C ₀	1,2 µF	4,9 µF
Inductivity L ₀	10 mH	50 mH

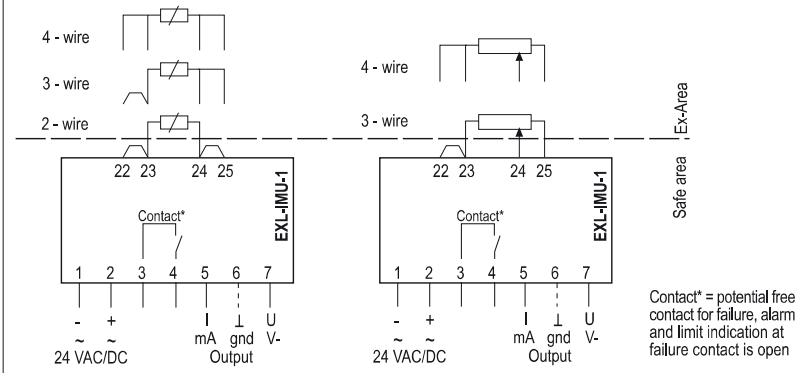
The maximum values must not be exceeded!
Please check your external capacities and inductivities in acc. to the length of the cable and the method of installation.

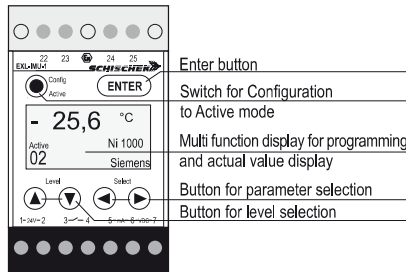
ATTENTION!

- For installation or maintenance official standards and rules must be adhered to!
- The energy of intrinsically safe circuits are below the level to start an explosion in the event of a spark.
- Intrinsic safe circuits must be installed with light blue coloured cables and separate installed from non intrinsic safe circuits. Distance between terminals of intrinsic safe circuits and non intrinsic safe circuits must be a minimum of 50mm.
- The EXL-IMU-1 modules must be installed in the safe area. Sensors must be passive and potential free for use in hazardous locations in zone 0, 1, 2 and 20, 21, 22.
- For applications in zone 20 and 21 you may use only sensors which apply the category 1D or 2D. In zone 0 only sensors which apply the category 1G
- Pay attention to the max values for sensors and wiring, listed in table 2.

ELECTRICAL CONNECTION

Temperature-/Humidity sensors Resistors linear, Potentiometer





Switching Configuration - Active

With the switching between "Active" = Operating modus and "Config" = Configuration mode, changes from the working function into the programming function. The switching from Active to Config is made by pushing one time the Config button (ConF in display) and then push the ENTER and Level up buttons at the same time.

After setup, start the active mode by pushing the config button.

- Active → Config Config → Active
1. ● 1x
 2. (ENTER) + ▲

Failure- and Alarm Indication

Different failure or alarm signals are indicated by contact and by display warnings. The following pictures show the most common errors and there cause.

Display

Failure

	Range Actual display value is flashing at low measuring range Sensor error, actual value is lower than adjusted range or there is a short circuit fault at wiring. Contact is active - display shows Error Sensor Range
	Range Display actual value is blinking at high measuring range Sensor error, actual value is higher than adjusted range or the wiring is open. Contact is active - display shows Error Sensor Range
	Range value over or under measurement range Value is over or under adjusted range Display shows Error Range, Contact isn't active
	03 Error Wire Compensation Error status at wire compensation Wire resistors more than 100 Ohm aren't accepted.

Notes to Sensors

For the following sensors there are separate datasheets for programming and setup available:
Sensor type Ring balance, Potentiometer

Resistors with and without slider are different in the setup Level 01. Without slider is figure 2 + resistor value and with slider is figure 3 + resistor value.

Ring balance linear and root extraction (m/s) are different in Level 01 Sensor selection. Special 2 is linear for Δp and Special 3 for m/s

Programming and Setup "Step by Step"

TEMPERATURE SENSORS

Connection Example: Pt100 DIN 2-wire
Range - 20...100 °C
Output 2-10 V, 4-20 mA
Limit low 0°C
Limit high 80°C

Active → Config 1. ● 1x 2. (ENTER) + ▲

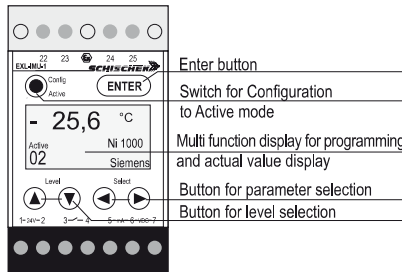
Level	Function	Display	Select
01	Select sensor type	01 Sensor Pt 100 DIN	Pt 100 DIN
02	Select 2-3-4 wire	2 Pt 100 DIN 02 Wire	2-wire
03	wire compensation	03 Start Pt 100 DIN Wire Compensation	ENTER Sensor short circuit, ENTER
04	Select start of measuring range	- 20.0 °C Range Pt 100 DIN 04 Start	- 20 °C
05	Select end of measuring range	100 °C Range Pt 100 DIN 04 End	100 °C
06	Select unit	The functions in Level 06 .. 09 are at temperature sensors presetted. Unit is °C, Decimal point is 0.1°C Begin and end measuring values depends on sensor type	
07	Select decimal point		
08	Select start of display value		
09	Select end of display value		
10	Output V/mA in fault conditions high or low	10 Error Output Pt 100 DIN	low
11	Analogue output V start value	2.0 V Range Pt 100 DIN Output 11 Start	2.0 V
12	Analogue output V end value	10.0 V Range Pt 100 DIN Output 12 End	10.0 V
13	Analogue output mA start value	4.0 mA Range Pt 100 DIN Output 13 Start	4.0 mA
14	Analogue output mA end value	20.0 mA Range Pt 100 DIN Output 14 End	20.0 mA
15	Contact low limit value	0.0 °C Limit Pt 100 DIN 15	0.0°C
16	Contact low limit On/Off	16 Limit Pt 100 DIN On	On
17	Contact high limit value	80.0 °C Limit Pt 100 DIN 17	80.0°C
18	Contact high limit On/Off	18 Limit Pt 100 DIN On	On
19	Actual value On/Off	19 Display On Pt 100 DIN	
Config → Active 1. ● 1x			

HUMIDITY SENSORS

Connection Example: 1kOhm 4 wire
Range 0...100 %
Output 0-10 V, 0-20 mA
Output in alarm situation decrease to 0 V / 0 mA
Limits

Active → Config 1. ● 1x 2. (ENTER) + ▲

Level	Function	Display	Select
01	Select sensor type	01 Sensor 0-1k Ohm 2	0-1kOhm (2)
02	Select 2-3-4 wire	4 0-1k Ohm 02 Wire	4-wire
03	wire compensation	This Level is automatically Passed	
04	Select start of measuring range	0.0 Ω Range 0-1k Ohm 04 Start	0 Ohm
05	Select end of measuring range	1000.0 Ω Range 0-1k Ohm 05 End	1000 Ohm
06	Select unit	06 Range Display %rF 0-1k Ohm 2	%rF
07	Select decimal point	07 Range Display %rF 0-1k Ohm 2	
08	Select start of display value	0.00 %rF Range 0-1k Ohm 08 Start Display	0.00 %rF
09	Select end of display value	100.00 %rF Range 0-1k Ohm 09 End Display	100.00 %rF
10	Output V/mA in fault conditions high or low	10 Error Output 0-1k Ohm 2	low
11	Analogue output V start value	0.0 V Range 0-1k Ohm Output 11 Start	0.0 V
12	Analogue output V end value	10.0 V Range 0-1k Ohm Output 12 End	10.0 V
13	Analogue output mA start value	0.0 mA Range 0-1k Ohm Output 13 Start	0.0 mA
14	Analogue output mA end value	20.0 mA Range 0-1k Ohm Output 14 End	20.0 mA
15	Contact low limit value	0.00 %rF Limit 0-1k Ohm 15	0.00 %rF
16	Contact low limit On/Off	16 Limit 0-1k Ohm Off	Off
17	Contact high limit value	100.0 %rF Limit 0-1k Ohm 17	100.0 %rF
18	Contact high limit On/Off	18 Limit 0-1k Ohm Off	Off
19	Actual value On/Off	19 Display On 0-1k Ohm 2	
Config → Active 1. ● 1x			



Switching Configuration - Active

With the switching between "Active" = Operating mode and "Config" = Configuration mode, changes from the working function into the programming function. The switching from Active to Config is made by pushing the Config button (ConF in display) and then push the ENTER and Level up button at the same time. After setup, start the active mode by pushing the config button.

- Active → Config Config → Active
1. +
 - 2.

Failure- and Alarm Signalisation

Different failure or alarm signal are indicated by contact and by display warnings. Following pictures shows the most indicated errors and there cause.

Display Failure

- Range Error: Actual display value is flashing at low measuring range. Sensor error actual value is lower than adjusted range or there is a short circuit fault at wiring. Contact is active - display shows Error Sensor Range.
- Range Error: Display actual value is blinking at high measuring range. Sensor error actual value is higher than adjusted range or the wiring is open. Contact is active - display shows Error Sensor Range.
- Range Error: value over or unter measurement range. Value is over or unter adjusted range. Display shows Error Range, Contact isn't active.
- : No value in display. Select in Level 19 configuration mode Display On.
- : Error status at wire compensation. Wire resistors more than 100 Ohm aren't accepted.

Notes to Sensors

For the following sensors there are separate datasheets for programming and setup available:
Sensor type Temperatur sensor, Humidity sensor

Resistors with and without slider are different in the setup Level 01. Without slider is figure 2 + resistor value and with slider is figure 3 + resistor value.

Ring balance linear and root extraction (m/s) are different in Level 01 Sensor selection. Special 2 is linear for Δp and Special 3 for m/s

Programming and Setup "Step by Step"

RING BALANCE (Δp, m/s)

Range Example: 0 ... 40 Pa
Output U/I 0...10 VDC/0...20 mA
Output in alarm situation increase to 10 V / 20 mA
Limits not applied

Active → Config 1. 1x 2. +

Level	Function	Display	Select
01	Select sensor type	01 Special 2	Special 2 (linear)
02			preselect no function
03	Calibration modus	CAL 03 Start Special 2	ENTER (Start) draw the needle to 0Pa ENTER
		CAL 03 End Special 2	End value needle per hand to 40Pa ENTER
04			preselect no function
05			
06	Select unit	Pa Pa	
07	Select decimal point	Pa --	
08	Select start of display value	0.00 Pa 0.00	
09	Select end of display value	40.00 Pa 40.00	
10	Output V7mA in fault conditions high or low	high	high
11	Analogue output V start value	0.00 V 0.0 V	
12	Analogue output V end value	10.00 V 10.0 V	
13	Analogue output mA start value	0.00 mA 0.0 mA	
14	Analogue output mA end value	20.00 mA 20.0 mA	
15	Contact low limit value	0.00 Pa 0.0	
16	Contact low limit On/Off	Off	Off
17	Contact high limit value	40.00 Pa 40.0	
18	Contact high limit On/Off	Off	Off
19	Actual value On/Off	Special 2	

Config → Active 1. 1x

POTENTIOMETER

Connection Example: 0-10 kOhm with slider
Range 0...10 kOhm
Output 0-10 V, 0-20 mA
Output in alarm situation increase to 10 V / 20 mA
Limits 1.000 kOhm, 9.000 kOhm

Active → Config 1. 1x 2. +

Level	Function	Display	Select
01	Select sensor type	01 0-10k Ω ₃	0-10 kOhm (3) 3 means slider connection
02	Select 2-3-4 wire	3 3	
03	Wire compensation	03 0-10k Ω ₃	push ENTER potentiometer turn left (low limit) push ENTER
04	Select begin of measuring range	0.000 kΩ 0.000 kOhm	
05	Select end of measuring range	10.000 kΩ 10.000 kOhm	
06	Select unit	kΩ kOhm	
07	Select decimal point	kΩ --	
08	Select start of display value	0.000 kΩ 0.000kOhm	
09	Select end of display value	10.000 kΩ 10.000 kOhm	
10	Output V/mA in fault conditions high or low	high	high
11	Analogue output V start value	0.0 V 0.0 V	
12	Analogue output V end value	10.0 V 10.0 V	
13	Analogue output mA start value	0.0 mA 0.0 mA	
14	Analogue output mA end value	20.0 mA 20.0 mA	
15	Contact low limit value	1.000 kΩ 1.000 kOhm	
16	Contact low limit On/Off	On	On
17	Contact high limit value	9.000 kΩ 9.000 kOhm	
18	Contact high limit On/Off	On	On
19	Actual value On/Off	0-10k Ω ₃	

Config → Active 1. 1x